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Factors Affecting the Awareness, Acceptance, and Hesitancy Among Unvaccinated Filipinos Without Medical Background Regarding SARS-CoV-2 (COVID-19) Vaccine

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ABSTRACT

COVID-19 vaccination is essential in resolving the pandemic but is in limited supply. Hence, vaccine hesitancy profiling is important to increase efficiency of distribution. This study aimed to determine the awareness, attitude, and acceptance/hesitancy among unvaccinated Filipinos regarding COVID-19, its vaccines, and the government's vaccination program. Factors influencing behaviors were also investigated.

Online survey using Google Forms was assessed for reliability based on previous vaccine studies and panel content review. Sample size (n = 438) validity was determined using Cochran's formula. Results revealed that there is moderate awareness of facts regarding COVID-19, vaccine etiology (50.06%), and vaccine complications (13.90%). Moreover, most respondents acquire information from traditional media (40.87%) over social media (36.99%). Majority agreed that everyone should get vaccinated (72.23%), and only few expressed fear of vaccine side effects (24.56%). Statistical analysis showed that gender is not associated with brand preference, knowledge, and attitude towards vaccination. Age and regionality are significantly associated with the participant's response. Respondents from Visayas and Mindanao showed less awareness and a more negative attitude about the issue.

Many respondents were willing to receive vaccination; however, lack of vaccine supply is the major problem. A proportion of the population will require better health education to address their misconceptions.

Keywords: COVID-19, vaccine awareness, vaccine hesitancy, public health, Philippines

INTRODUCTION

Background of the Study

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been the fifth documented pandemic in the last century. When Wuhan, China, became the first epicenter of the current pandemic, the Chinese government implemented a swift mitigation measure including a complete lockdown of the entire city, case identification, large-scale surveillance, and isolation and identification of the etiologic agent (Liu et al., 2020). The disease caused by the virus was later officially named COVID-19 (Centers for Disease Control and Prevention [CDC], 2021b). By early January 2020, China made publicly available the novel virus genome sequence for the world experts to use (AlTakarli, 2020).

The new virus swept through Europe in March of 2020 causing 4,899 deaths before they were able to close their borders. And by April 2020, it crippled the United States with more than 700,000 confirmed COVID-19 cases (European Commission, 2020; Linka et al., 2020; Schuchat & CDC, 2020; World Health Organization [WHO], 2020a).

From the first case of COVID-19 in the Philippines in January 2020, the spread of the infection became a public health ordeal especially for the elderly population and those with comorbidities (Department of Health [DOH], 2020; Edrada et al., 2020). The global spread of COVID-19 prompted the Philippine government to place the entire Luzon under strict community quarantine from March 17, 2020, to April 13, 2020, especially the National Capital Region (Official Gazette, 2020).

Predecessors of SARS-CoV-2

The novel coronavirus SARS-CoV-2 is part of a family of zoonotic viruses that have crossed over to humans (Kaur & Gupta, 2020). SARS first emerged from China in 2002. With the coordinated effort of the Global Outbreak Alert and Response Network, the spread was contained in only several countries. Though it is not as highly transmissible as influenza, asymptomatic patients were able to travel unnoticed (Shaw, 2006; WHO, 2003).

In 2012, a more virulent strain emerged in the Arabian Peninsula. The Middle East Respiratory Syndrome Coronavirus (MERS-CoV) had a case fatality rate of 43% but low human-to-human transmission (Hajjar et al., 2013). The spread of MERS-CoV involved many health care workers (HCWs), and reverse transcription-polymerase chain reaction (RT-PCR) assays have become the gold standard in detecting coronavirus (Mackay & Arden, 2015).

After the SARS 2002 outbreak, the WHO established networks to link experts for fast exchange of information and technology such as infection control practices, use of personal protective equipment, isolation protocol, adherence to proper handwashing, and education of HCWs among others (Shaw, 2006; WHO, 2003).

COVID-19 Vaccine Development, Clinical Trials, and Authorization

Since the discovery of vaccines, they have been shown to be effective in preventing infectious diseases, such as measles, polio, and influenza among others. Establishment of "herd" immunity thru vaccination has been critical in indirectly protecting immunocompromised members of the community (WHO, 2020b).

Resurgence of cases can occur in the absence of herd immunity against COVID-19 as suggested by the increase in reported cases few days after relaxation of public health measures (Leung et al., 2020). Development of an efficient COVID-19 vaccine is the best option for suppressing the current pandemic for the long term (Haidere et al., 2021). Thus, on March 18, 2020, the US Food and Drug Administration (USFDA) and the European Medicines Agency (EMA) met to discuss the global regulatory strategies to facilitate SARS-CoV-2 vaccine development (Marks, 2020).

There are hundreds of candidate COVID-19 vaccines in development and undergoing clinical trials. (Sadarangani et al., 2021). The vaccine vetting process includes a phase 3 clinical trial with at least 2 months of follow-up showing a high level of protection as well as transparent safety data (Hahn, 2020; USFDA, 2020a). All phase 3 trials are designed as randomized, placebo-controlled clinical trials (RCTs) to ensure the minimum ethical and scientific standards. The trials are also designed to determine protection against symptomatic infections (Kim et al., 2021).

Among patients infected with COVID-19, the early detection of SARS-CoV-2 spike (S)-protein-targeted neutralizing antibodies (NAbs) is correlated with survival. Hence, it is accepted that an effective vaccine would involve eliciting Nab response. However, there are other types of vaccines that are not directed towards Nabs that may be involved in antibody-dependent cellular and humoral responses (Sadarangani et al., 2021).

In December 2020, the Pfizer-BioNTech COVID-19 vaccine for 16 years old and older was the first to receive USFDA emergency use authorization (EUA; USFDA, 2020b) followed by the Moderna COVID-19 vaccine for individuals 18 years old and older (USFDA, 2020c).

Both the Pfizer-BioNTech and Moderna COVID-19 vaccines contain the viral messenger RNA (mRNA) that transcribes the spike (S) protein. The mRNA vaccines are not expected to affect the DNA of the host cell, since the mRNA will be degraded as soon as it has been used to transcribe the spike protein (WHO, 2020b). The Pfizer-BioNTech international RCT revealed 95% effectivity in preventing COVID-19 disease (USFDA, 2020b).

Meanwhile, the Moderna COVID-19 vaccine RCT conducted in the United States resulted in 94.1% effectiveness in preventing COVID-19 disease with no severe cases reported (USFDA, 2020c). Serious adverse events reported were inconclusive (CDC, 2021a; CDC, 2021c).

As of December 31, 2020, the WHO approved EUA for other COVID-19 vaccines such as AstraZeneca (AZD1222), Janssen (Johnson & Johnson), and Sinopharm (Beijing Bio-Institute of Biological Products; WHO, 2021b).

The AstraZeneca/Oxford vaccine contains the p5713 pDEST-ChAdOx-1-nCOV-19 plasmid, which inserts the SARS-CoV-2 gene sequence into the ChAdOx1 adenovirus genome to induce an immune response (Kaur & Gupta, 2020). RCTs of AZD1222 were conducted in the United Kingdom, South Africa, and Brazil among adults aged 18 years old and older. The UK and Brazil showed 87.8% efficacy against symptomatic COVID-19 infection with no hospital admission reported. While other studies showed moderate effectivity against symptomatic COVID-19 infection with 62.1% (first dose) and 90.0% (second dose; Knoll & Wonodi, 2021). AstraZeneca/Oxford submitted a final corroborated result of 79% effectivity (Callaway & Mallapaty, 2021). The advantage of the AstraZeneca/Oxford study was the diversity of the subjects' races and ethnicities. Furthermore, the stability of the vaccine only needs the use of routine refrigerated cold chain for its transport (Knoll & Wonodi, 2021).

Initially, the USFDA rejected issuance of EUA for Covaxin developed by Bharat Biotech and US Company Ocugen due to inadequate results from clinical trials. Despite this stumbling block, they secured exclusive rights to market the vaccine in Canada pending approval by the health authorities (Chatterjee, 2021). The Philippine Food and Drug Administration has approved Covaxin for emergency use in our country (Dela Cruz, 2021).

The Janssen (Johnson & Johnson) COVID-19 vaccine is a recombinant vector vaccine delivering human adenovirus to express the SARS-CoV-2 spike protein. The DNA is modified so that it cannot replicate in humans (National Institutes of Health, 2021). It is given as a single-dose vaccine with 72% effectivity in protecting against the moderate and severe forms of the disease based on its US phase 3 trial. In Brazil, the vaccine was 68.1% effective, while in South Africa, it was 57% effective (Choi, 2021).

CoronaVac (Sinovac, China) is an inactivated vaccine made from Vero cells inoculated with SARS-CoV-2 (CZ02 strain). Phase 1 using medium dose (3 μg)

demonstrated 45.8% and 25.0% seroconversion of neutralizing antibodies to live SARS-CoV-2 by day 14 and day 28 postvaccination, respectively. Results of the phase 2 study improved to 96.5% and 97.4%, respectively (Zhang et al., 2021). Clinical trials done in Turkey, Chile, Indonesia, and Brazil revealed effectivity of protection against symptomatic COVID-19 ranging from 50% to 89%. Furthermore, RCTs done in Turkey and Brazil showed 100% protection against hospitalization. Serious adverse events reported were not significantly different between vaccine and placebo groups (Strategic Advisory Group of Experts, 2021).

Controversies plagued the Russian Gam-CID-Vac (Sputnik V) due to Russia's authorization of its use before early trial results were published. However, recent evidence suggests that it is effective and safe. It has been used by 67 countries, including the Philippines (Nogrady, 2021). Sputnik V is made up of two adenoviruses (Ad26 and Ad5) modified to contain the gene for making the SARS-CoV-2 spike protein (EMA, 2021). The phase 3 clinical trial demonstrated 91.6% effectivity in preventing symptomatic COVID-19 in adults. It reported similar rare adverse events similar to AstraZeneca and Johnson & Johnson vaccines (Lawton, 2021).

Continued surveillance of SARS-CoV-2 evolution is essential in the possible further development of the COVID-19 vaccine. With the sequence variations emerging, the vaccine developed for the strains isolated in 2019 may not be as effective against new SARS-CoV-2 strains in the future (Kim et al., 2021).

Disparity of Disease Burden and Vaccine Distribution

Prior to the pandemic, low- to middle-income countries (LMICs) were already struggling with many challenges. Citizens of LMICs were moving about undiagnosed and untreated making it easier to spread the infection. LMIC health care facilities are also underfunded and ill-equipped (Choi, 2021).

In early 2020, the USA and UK made bilateral agreements with vaccine manufacturers by investing in vaccine development. Hence, they received the first batches of vaccines, while LMICs with no manufacturing capabilities are relying on others for vaccine supplies (Choi, 2021).

To make vaccine distribution equitable, WHO partnered with various organizations to form a coalition called the "COVAX Facility" (WHO, 2021a). Countries including China, the European Union, and the USA pooled resources to equitably distribute vaccines at a not-for-profit price (Choi, 2021; Kim et al., 2021). However, the Coalition for Epidemic Preparedness Innovations (CEPI) estimates that vaccine companies have limited manufacturing capacity. Hence, it would be around 2023–2024 before enough vaccines will be available to interrupt the transmission of the infection (Kim et al., 2021).

Philippine Vaccination Program

Through Executive Order No. 121, the following COVID-19 vaccine brands were granted EUA: (1) Pfizer-BioNTech, (2) AstraZeneca, (3) Coronavac (Sinovac), (4) Sputnik V, (5) Janssen, (6) Covaxin, (7) Moderna, and (8) Sinopharm (Food and Drug Administration [FDA] Philippines, 2021).

The Philippines aimed to vaccinate up to 20% of the population by the end of year 2021 (Orbina, 2021). The government purchased 25 million doses of Sinovac, and the first batch was delivered on February 23, 2021, which officially kicked off the implementation phase of the government's vaccination program (DOH, 2021a; Morales, 2021). This was followed by the first batch of AstraZeneca vaccines in March 2021. The Philippines' Inter-Agency Task Force (IATF) spearheaded the rollout of the COVID-19

vaccination campaign (FDA Philippines, 2021).

Vaccine Hesitancy

As defined by the Strategic Advisory Group of Experts on Immunization, "vaccine hesitancy refers to delay in acceptance or refusal of vaccines despite availability of vaccine services" (MacDonald, 2015).

Despite the assurance of WHO, EMA, CDC, and USFDA that no shortcuts were taken during the development and clinical trial of the approved COVID-19 vaccines, a considerable proportion of the world population still hesitates in getting their vaccine shots (Fridman et al., 2021).

In the USA, only 51% of adults expressed their intent to get the vaccine. In the sub-Saharan African region, the resistance to the vaccine paused the clinical trial, except for South Africa (Choi, 2021). Hence, there is a need to better understand the underlying reason for vaccine hesitancy.

Global Awareness and Acceptance of the COVID-19 Vaccines

Numerous studies have been conducted globally to assess the knowledge and attitude of individuals regarding COVID-19 and its vaccines. Many of these studies were conducted in the early phase of the pandemic when most vaccines were still in their phase 1 and phase 2 stages.

In mid-2020, a survey on 510 HCWs in Saudi Arabia showed that only two-thirds have adequate knowledge about COVID-19. Similarly, clinic attendants in Nepal showed even less adequate knowledge regarding the disease (Almohammed et al., 2021; Devkota et al., 2020). In contrast, more than 80% of HCWs surveyed in India had adequate knowledge regarding COVID-19 (Gopalakrishnan et al., 2020). Among HCWs in Congo, misinformation is also shown to have a direct effect on the provision of health care for COVID-19 patients (Al-Marshoudi et al., 2021).

Knowledge of the general population is also important in addressing the challenge posed by this pandemic. Studies on general population in the Philippines and in Oman showed high awareness of facts regarding COVID-19. However, there were plenty of misinformation going around since they received most of their information from social media (Almohammed et al., 2021; Bautista et al., 2020).

Misinformation was shown to be the main predictors of vaccine hesitancy, while positive attitudes towards the vaccine according to age, sex, and educational background differ from one country to another. However, individuals with good knowledge regarding COVID-19, those who take flu shots prior, and those with existing comorbidities have a more positive attitude towards COVID-19 and are willing to get the shot when it becomes available in their country (Abebe et al., 2021; Almohammed et al., 2021; Ciardi et al., 2021; Paul et al., 2021).

Problem Statement

Although majority of the world population has accepted vaccination as an effective intervention in curbing the spread of infection, there are still some who refuse or delay vaccination (MacDonald, 2015). For COVID-19 vaccines that come in limited supply, it is crucial for each dose to reach the arms of the people. Vaccine wastage is not an option. Hence, it is necessary to launch an effective health promotion and education campaign to increase likelihood of the individual eligible for vaccination to arrive at the place and time of appointment. To do so, it is essential to determine what is the level of awareness, attitude, and acceptance or hesitancy among the public and investigate the factors influencing these behaviors.

Research Objectives

This study aimed to determine the awareness, attitude, and acceptance or

hesitancy among the unvaccinated general Filipino population regarding COVID-19, its vaccines, and the government's vaccination program. The study also investigated the influence of factors, such as gender, age groupings, and region of residence, to the participants' responses.

Scope and Limitations

Due to the ongoing enhanced community quarantine, only individuals with access to the internet were able to fill the Google Forms online survey forms. All (COVID-19) unvaccinated adults 20 years old and above were invited to participate in the study using the chain-referral method. Online messaging platforms, such as Messenger and Viber, were used to send the link to the Google Form. Potential respondents with the following characteristics were excluded from the study: (1) those who already had COVID-19 infection or vaccination, (2) HCWs, (3) students in the medical field, (4) those with impaired cognitive function, and (5) those younger than 20 years of age.

Significance of the Study

This research will help in determining knowledge gaps regarding COVID-19 and its vaccines. Misconceptions and negative attitudes towards COVID-19 and its vaccination can be addressed to help the government in mitigating the current pandemic. This study also looks to provide a foundation on which to identify future opportunities for further research and initiatives.

METHODOLOGY

Participants and Procedure

The study participants included 438 Filipinos aged 20 years old and above residing in the Philippines who remained unvaccinated with any of the COVID-19 vaccines distributed by the government at the time of survey. Sample size was determined using Cochran's formula allowing 5% margin of error with confidence interval of 95%. The online survey was conducted between August 18 and 27, 2021, for a total of 10 days.

Collection Tool

Participants had the choice of answering either an English or a Filipino version of the online survey using Google Forms. Most questions were provided with a drop-down menu for a convenient selection of appropriate answers. For responses not included in the choices, an open option was available. Reliability of the survey form was determined based on the insights of published COVID-19 vaccine studies focusing on knowledge, attitude, and practice (Abebe et al, 2021; Al-Marshoudi et al., 2021; Bautista, et al., 2020; Ciardi et al., 2021).

The survey proper had two sections: (1) sociodemographic information of the participants and (2) questions regarding the participant's awareness of facts and attitudes/belief regarding COVID-19, its vaccines, and the government's vaccine program.

Research Design

This is a cross-sectional mixed method study using closed-ended questions with an open option for the sociodemographic data and the Likert scale for assessing the level of awareness, attitude, and acceptance or hesitancy of respondents. Sample size ($n = 438$) was validated using Cochran's formula.

Data Analysis Strategy

Descriptive data were sorted and analyzed using MS Excel 365, whereas chi-square with the Fisher Exact Test was used to find association between the factors (gender, age groupings, and region of residence) and the response to questions pertaining to correctness of knowledge, positivity of attitude, and presence of

hesitancy using Software for Statistics and Data Science (Stata 14) software.

Ethical Consideration

This study was conducted following the Declaration of Helsinki and the De La Salle University Code of Research Ethics. Each participant was asked to approve an informed consent prior to the start of the survey proper.

RESULTS AND DISCUSSION

Sociodemographic Characteristics

The research study was able to include a pool of respondents that is relatively uniform in distribution. As seen in Table 1, the respondents have a sex ratio of 0.955 and an age distribution of 40.18% for the young adult group (20–39 years), 32.88% for the middle-aged adult group (40–59 years), and 26.94% for the elderly group (60 years and older).

The general demographic characteristics of the respondents (Table 1) show equal representation across Luzon, particularly the National Capital Region (29.65%), Northern Luzon (23.52%), and Southern Luzon (26.48%). Though less represented, the study was still able to receive response from 53 individuals from Visayas (12.10%) and 36 individuals from Mindanao (8.22%). Majority of the respondents are college graduates (59.59%) followed by high school graduates (26.48%). The respondents came from a diverse occupational background representing nonmedical students (19.86%), the white-collar sector (31.96%), the blue-collar or service sector (26.03%), and the retired or currently unemployed (22.15%).

Studies have shown that age older than 25 years old, higher educational attainment, and employer's recommendation increased likelihood of acceptance to vaccination, while unemployment increases the risk of vaccine hesitancy (Joshi et al., 2021).

Table 1. Frequency Distribution of the Demographic Characteristics of Respondents (n = 438)

Variable	Male	Female	Total	Percentage
Age Group				
20–39 years	91	85	176	40.18%
40–59 years	65	79	144	32.88%
≥60 years	58	60	118	26.94%
Area of Residence				
NCR	54	76	130	29.68%
North Luzon	53	50	103	23.52%
South Luzon	64	52	116	26.48%
Visayas	28	25	53	12.10%
Mindanao	15	21	36	8.22%
Level of Education				
Elementary	14	15	29	6.62%
High school	61	56	117	26.71%
College	126	135	261	59.59%
Postgraduate	10	15	25	5.71%
Not applicable	3	3	6	1.37%
Occupation				
Students	49	38	87	19.86%
White-Collar Sector				
Accounting/ finance	4	5	9	2.05%
Information technology	8	4	12	2.74%
Architecture	3	1	4	0.91%
Arts/media	1	3	4	0.91%
Call center	1	2	3	0.68%
Clerical work/ employee	21	20	41	9.36%
Education	9	15	24	5.48%
Engineering	12	4	16	3.65%
Entrepreneur	9	3	12	2.74%
Government employee	1	6	7	1.60%
Legal/ paralegal	3	2	5	1.14%
Managerial	2	1	3	0.68%
Blue-Collar/Service Sector				
Agriculture/ aquaculture	9	2	11	2.51%
Church/ social worker	1	1	2	0.46%
Construction	9	0	9	2.05%
Housewife	0	37	37	8.45%
Marketing/ sales	5	13	18	4.11%
OFW	2	1	3	0.68%
Seafarer	4	0	4	0.91%
Service work	12	18	30	6.85%
Others				
Retired citizen	17	11	28	6.39%
Unemployed	32	37	69	15.75%

Table 2. Multiple Response Frequency Distribution of Existing Comorbidities Among Respondents

Variables	Frequency	Percentage
Respondents without comorbidity reported	275	62.79%
Respondents with comorbidity reported	163	37.21%
Reported Comorbidities Among the 163 Respondents (n = 249)		
Cardiovascular disorder	86	34.54%
Metabolic disorder	53	21.29%
Respiratory disorder	53	21.29%
Immunologic disorder	15	6.02%
Neurologic disorder	14	5.62%
Gastrointestinal disorder	9	3.61%
Cancer	6	2.41%
Rheumatologic disorder	4	1.61%
Hematologic disorder	3	1.20%
Others	6	2.41%

A total of 275 (62.79%) respondents reported that they do not have any known comorbidity (Table 2). The rest of the respondents stated at least one comorbidity with a total of 249 responses. Out of the 249 comorbidities reported, cardiovascular disorders (CVDs) top the list with 34.54%. CVDs included hypertension, various heart conditions, and previous heart attacks. This is followed by metabolic disorders with 21.29%, which included diabetes, obesity, thyroid disorders, and hyperuricemia. Those with respiratory disorders are asthma patients except for one respondent with chronic obstructive pulmonary disease (COPD). Those with neurologic disorder reported mostly history of cerebrovascular accident and one case each of Parkinson's and Alzheimer's disease. Gastrointestinal disorders stated include gastroesophageal reflux, hyperacidity, fatty liver, and history of gallbladder stones among others. Reported cancer cases included leukemia, breast, colon, thyroid, and prostate cancers.

Meta-analytical studies showed that age, sex, obesity, and multiple comorbidities increase the risk of adverse outcomes (Booth et al., 2021). Pooled odds ratios of developing severe case of COVID-19 for hypertensive patients are 2.21 (95% CI: 1.58–3.10) for those younger than 50 years old and 2.32 (95% CI: 1.70–3.17) for those 50 years and older (Zhang et al., 2020). A UK cohort study on death in hospitals among confirmed COVID-19 cases showed strong association with being male (hazard ratio [HR] = 1.99, 95% CI: 1.88–2.10), uncontrolled diabetes (HR = 2.36, 95% CI: 2.18–2.56), and severe asthma (HR = 1.25, 95% CI: 1.08–1.44) among other prior medical conditions (Williamson et al., 2020). Likewise, cancer patients were shown to have higher risk of developing severe COVID-19 compared to patients without cancer with an odds ratio of 3.61 (95% CI: 2.59–5.04; Tian et al., 2020).

Table 3. Demographic Characteristics of Respondents Related to COVID-19 (n = 438)

Variables	Frequency	Percentage
Source of information		
Radio/TV	179	40.87%
Social media	162	36.99%
Friends and relatives	49	11.19%
Government officials	24	5.48%
Private medical worker	19	4.34%
Newspaper	5	1.14%
Had a family member or close relative infected with COVID-19		
Yes	137	31.28%
No	301	68.72%
Had a family member or close relative who died of COVID-19		
Yes	43	9.82%
No	395	90.18%

Demographic characteristics of respondents related to COVID-19 (Table 3) revealed that a significant portion of the respondents received their information regarding the current pandemic from traditional radio or television mass media (40.87%), followed by respondents relying on social media platforms for their information (36.99%). Information received from social media is not strictly regulated, which can affect spread of misinformation (Pulido et al., 2020). Unfortunately, only a few mentioned that they received their information directly from government workers or private medical workers. This may be attributed to the strict community quarantine implemented. Our perception is

also influenced by life experiences. Among the respondents, 31.28% have a family member or close relative infected with COVID-19, while 9.82% have a family member or close relative who died from the disease.

As shown in Figure 1, the primary reason for remaining unvaccinated for many of the respondents is that they have been placed in the waiting list for vaccination (40.64%), while 20.09% of the respondents expressed fear of the side effects of the COVID-19 vaccine as their primary reason. When asked about their secondary reason for remaining unvaccinated, lack of vaccine supply (23.97%), which is the root cause for having a long waiting list, is the most common opinion. These responses show that majority of the respondents are willing to get their COVID-19 vaccine shots; however, due to the limited supply of the vaccine, the respondents remain unprotected from the current pandemic.

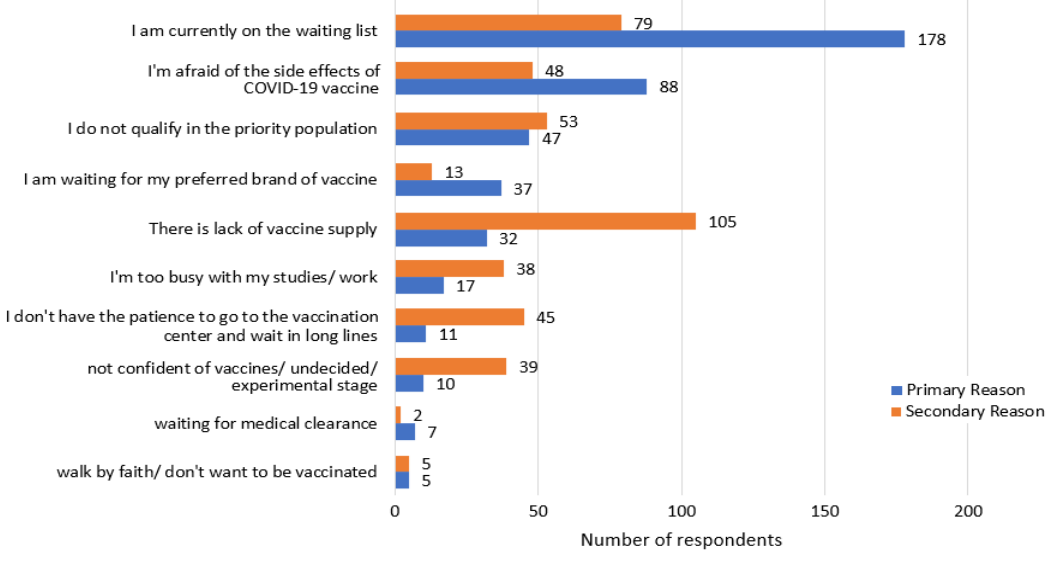

Figure 1. Top 10 primary and secondary reasons for remaining unvaccinated during the time of survey (n = 438).

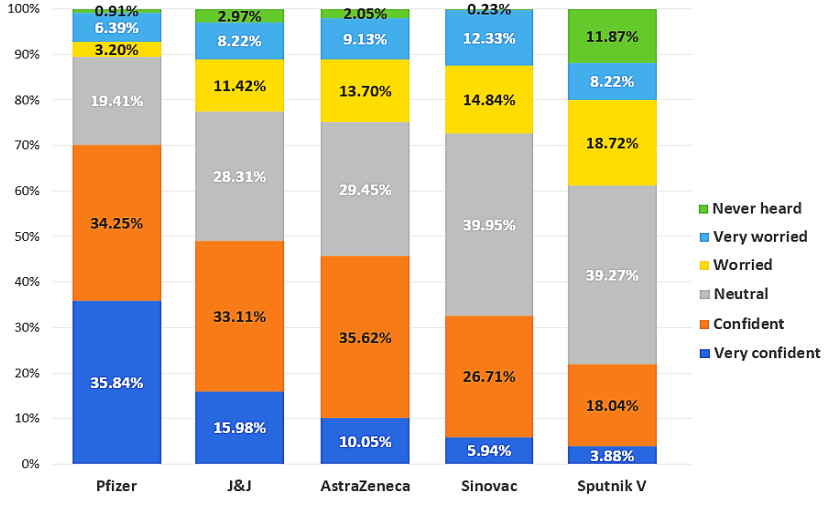

Figure 2. Comparison of the percentage distribution of the respondents' confidence in efficacy and safety of the available COVID-19 vaccines in the Philippines (n = 438).

Figure 2 compares the respondents' confidence to the publicly distributed COVID-19 vaccines in the Philippines. There is an overwhelming difference in the total confidence of respondents to the Pfizer-BioNTech vaccine (70.09%) compared to others. In far second is Janssen Johnson & Johnson with total confidence of 49.09% followed by AstraZeneca with total confidence of 45.67%. Sinovac, which is the most distributed vaccine in the country, got a total of 32.65% confidence vote with only 5.94% having strong conviction. This may have been influenced by the initial studies on Sinovac wherein the recommended 3-µg dose only attained 46% seroconversion of neutralizing antibodies after 14 days (Zhang et al., 2021). However, phase 3 trials done in densely populated Brazil, Indonesia, and Turkey showed vaccine efficacy ranging from 51% to 83.5% against symptomatic SARS-CoV-2 infection, with up to 85% protection against requiring hospitalization (WHO, 2021c).

Chi-square with Fisher Exact Test analysis showed that there is no significant association with gender when it comes to level of confidence in the different vaccine brands ($p > 0.05$). However, age groupings are a significant associating factor when it comes to their level of confidence in the efficacy and safety of Pfizer ($p = 0.022$), AstraZeneca ($p = 0.001$), and Sputnik V ($p = 0.011$). Similarly, the region of residence is a strong factor for determining level of confidence in all vaccine brands ($p < 0.05$), except Sinovac ($p = 0.685$).

Table 4 shows the percentage distribution of correct answers to awareness questions according to gender. Half of the respondents are not aware of the difference between bacteria and virus as causative agents (male = 52.34%, female = 47.77%). Likewise, almost half of the respondents believe that COVID-19 infection is just similar to the common cough and cold (male = 49.07%, female = 43.75%). Statistical analysis revealed that there is no significant association between the correctness of facts and gender, except for issues involving babies and children getting a bad case of COVID-19 infection ($p = 0.016$), in which more female respondents were able to answer correctly. This is congruent with the study done in 2020 on pregnant women and new mothers wherein it was identified that there is an increase in self-reported anxiety before and during the pandemic (Davenport, 2020).

In general, respondents of both genders do not have a very positive attitude when it comes to COVID-19 strategies and its vaccines (Table 5). But despite the challenges brought about by the pandemic, majority of the respondents are positive that everyone should get vaccinated against COVID-19 with 75.70% of men and 68.75% of women agreeing. Though majority of respondents are not afraid of the side effects of the COVID-19 vaccine, men (29.91%) are significantly ($p = 0.011$) more expressive of their fear of the side effects of the COVID-19 vaccine compared to women (19.20%). This is contrary to many studies done on vaccine hesitancy, wherein it is often women who try to delay getting their vaccine shots (Callaway & Mallapaty, 2021; Hou et al., 2020).

Age grouping is an important factor influencing the awareness, attitude, and acceptance or hesitancy of the respondents regarding COVID-19 and its vaccines. Overall, young adults are generally more knowledgeable regarding the issue compared to other age groups (Table 6). Although their level of awareness regarding the etiologic agent of COVID-19 is only 55.68%, they are still significantly more knowledgeable compared to other age groups ($p = 0.014$). There is also a significant association between age groups and level of awareness on questions regarding babies and children getting COVID-19 ($p = 0.025$), free vaccination ($p = 0.008$), a fully vaccinated person still getting COVID-19 infection ($p = 0.008$), and vaccine

complications requiring hospitalization ($p = 0.042$).

In terms of attitude among the different age groups (Table 7), there was not enough evidence to show significant association with most issues except about delaying COVID-19 vaccination unless the pandemic turns for the worse ($p = 0.001$) and expressing their fear of the side effects of the COVID-19 vaccine ($p = 0.000$), wherein the young adults show a more positive outlook.

Table 4. Comparison of the Percentage Distribution of the Respondents' Correct Awareness of Facts About COVID-19 and Its Vaccines According to Gender ($n = 438$)

Awareness Questions	Male	Female	*p*-Value
COVID-19 is caused by bacteria.	52.34%	47.77%	0.490
People with hypertension, diabetes, or obesity are more likely to need hospitalization or die from the infection.	65.89%	74.55%	0.397
Babies and children can get a bad case of COVID-19 infection.	60.28%	71.43%	0.016
A person suspected of COVID-19 infection should be isolated for at least 14 days.	92.52%	92.41%	0.986
The government is giving out the COVID-19 vaccine to all Filipinos for free.	84.11%	86.16%	0.688
You can still have COVID-19 infection even after getting fully vaccinated.	85.51%	88.84%	0.334
The COVID-19 vaccines imported by the government are approved and endorsed by the World Health Organization (WHO).	82.24%	84.38%	0.829
COVID-19 vaccines need to be kept in cold temperature all the time to make sure they remain effective.	75.23%	82.59%	0.371
Mask wearing, frequent handwashing, and avoiding crowded areas are still necessary even if you are fully vaccinated.	89.72%	94.20%	0.197
There is at least 5% chance of needing hospitalization due to vaccine complications.	12.62%	15.18%	0.631
COVID-19 infection is similar to the common cough and colds.	49.07%	43.75%	0.719

Table 5. Comparison of the Percentage Distribution of the Respondents' Positive Attitude About COVID-19 Strategies and Its Vaccines According to Gender

Attitude/Beliefs Questions	Male	Female	*p*-Value
I believe that allowing people to get naturally infected will be better in achieving herd immunity (community-wide resistance to infection).	47.66%	44.20%	0.920
I trust that the COVID-19 vaccines issued by the government are safe and effective.	66.82%	57.59%	0.126
I want to avoid getting the COVID-19 vaccine unless the pandemic turns for the worse.	57.01%	54.02%	0.192
Everyone should get vaccinated against COVID-19.	75.70%	68.75%	0.266
I am afraid of the side effects of the COVID-19 vaccine.	29.91%	19.20%	0.011

Table 6. Comparison of the Percentage Distribution of the Respondents' Correct Awareness of Facts About COVID-19 and Its Vaccines According to Age Group ($n = 438$, $p < 0.05$)

Awareness Questions	Age Group (in years)			*p*-Value
	20–39	40–59	≥60	
COVID-19 is caused by bacteria.	55.68%	47.92%	44.07%	0.014
People with hypertension, diabetes, or obesity are more likely to need hospitalization or die from the infection.	64.77%	75.69%	72.88%	0.182
Babies and children can get a bad case of COVID-19 infection.	75.57%	61.11%	57.63%	0.025
A person suspected of COVID-19 infection should be isolated for at least 14 days.	93.75%	91.67%	91.53%	0.430

The government is giving out the COVID-19 vaccine to all Filipinos for free.	81.25%	86.81%	88.98%	0.008
You can still have COVID-19 infection even after getting fully vaccinated.	93.75%	84.72%	80.51%	0.006
The COVID-19 vaccines imported by the government are approved and endorsed by the World Health Organization (WHO).	82.39%	86.81%	80.51%	0.750
COVID-19 vaccines need to be kept in cold temperature all the time to make sure they remain effective.	76.14%	80.56%	81.36%	0.504
Mask wearing, frequent handwashing, and avoiding crowded areas are still necessary even if you are fully vaccinated.	94.89%	91.67%	88.14%	0.440
There is at least 5% chance of needing hospitalization due to vaccine complications.	8.52%	20.14%	14.41%	0.042
COVID-19 infection is similar to the common cough and colds.	49.43%	47.22%	40.68%	0.383

Table 7. Comparison of the Percentage Distribution of the Respondents' Positive Attitude About COVID-19 Strategies and Its Vaccines According to Age Group (n = 438)

Attitude/Belief Questions	Age Group (in years)			p-Value
	20–39	40–59	≥60	
I believe that allowing people to get naturally infected will be better in achieving herd immunity (community-wide resistance to infection).	50.57%	43.75%	41.53%	0.582
I trust that the COVID-19 vaccines issued by the government are safe and effective.	67.05%	59.72%	57.63%	0.077
I want to avoid getting the COVID-19 vaccine unless the pandemic turns for the worse.	66.48%	55.56%	38.98%	0.001
Everyone should get vaccinated against COVID-19.	78.41%	70.14%	65.25%	0.130
I am afraid of the side effects of the COVID-19 vaccine.	33.52%	20.83%	15.25%	0.000

Table 8. Comparison of the Percentage Distribution of the Respondents' Correct Awareness of Facts About COVID-19 and Its Vaccines According to Region of Residence

Awareness Questions	NCR	North Luzon	South Luzon	Visayas	Mindanao	p-Value
COVID-19 is caused by bacteria.	58.46%	49.51%	36.21%	49.06%	66.67%	0.003
People with hypertension, diabetes, or obesity are more likely to need hospitalization or die from the infection.	73.08%	77.67%	62.07%	71.70%	63.89%	0.276
Babies and children can get a bad case of COVID-19 infection.	73.08%	80.58%	54.31%	47.17%	63.89%	0.006
A person suspected of COVID-19 infection should be isolated for at least 14 days.	95.38%	96.12%	89.66%	86.79%	88.89%	0.042
The government is giving out the COVID-19 vaccines to all Filipinos for free.	83.08%	90.29%	84.48%	86.79%	77.78%	0.403
You can still have COVID-19 infection even after getting fully vaccinated.	95.38%	93.20%	78.45%	83.02%	75.00%	0.001
The COVID-19 vaccines imported by the government are approved and endorsed by the World Health Organization (WHO).	82.31%	89.32%	81.03%	86.79%	72.22%	0.116
COVID-19 vaccines need to be kept in cold temperature all the time to make sure they remain effective.	81.54%	91.26%	68.10%	73.58%	77.78%	0.082
Mask wearing, frequent handwashing, and avoiding crowded areas are still necessary even if you are fully vaccinated.	94.62%	96.12%	89.66%	90.57%	80.56%	0.005
There is at least 5% chance of needing hospitalization due to vaccine complications.	12.31%	20.39%	12.93%	9.43%	11.11%	0.207
COVID-19 infection is similar to the common cough and colds.	46.15%	53.40%	43.97%	43.40%	38.89%	0.601

Table 9. Comparison of the Percentage Distribution of the Respondents' Positive Attitude About COVID-19 Strategies and Its Vaccines According to Region of Residence

Attitude/Belief Questions	NCR	North Luzon	South Luzon	Visayas	Mindanao	*p*-Value
I believe that allowing people to get naturally infected will be better in achieving herd immunity (community-wide resistance to infection).	48.46%	43.69%	43.97%	39.62%	58.33%	0.055
I trust that the COVID-19 vaccines issued by the government are safe and effective.	57.69%	75.73%	57.76%	60.38%	55.56%	0.236
I want to avoid getting the COVID-19 vaccine unless the pandemic turns for the worse.	60.00%	57.28%	55.17%	50.94%	41.67%	0.019
Everyone should get vaccinated against COVID-19.	68.46%	85.44%	68.10%	67.92%	66.67%	0.010
I am afraid of the side effects of the COVID-19 vaccine.	23.85%	30.10%	22.41%	15.09%	30.56%	0.261

The Sustainable Development Goal set by the United Nations emphasizes the integrated approach to "just, rights-based, equitable and inclusive" action (WHO, 2017). Tables 8 and 9 show a significant disparity is seen between the National Capital Region and the rest of the country. There is significant association between region of residence and the respondent's level of awareness when it comes to questions regarding the etiologic agent of COVID-19 ($p = 0.003$), babies and children getting COVID-19 infection ($p = 0.006$), isolation of a person suspected of having COVID-19 infection ($p = 0.042$), getting COVID-19 infection despite being fully vaccinated ($p = 0.001$), and observance of safety protocols despite being fully vaccinated ($p = 0.005$). There is also significant association between the region of residence and the attitude of respondents to questions regarding delaying COVID-19 vaccination unless the pandemic turns for the worse ($p = 0.019$) and if everyone should get vaccinated against COVID-19 ($p = 0.010$).

CONCLUSION AND RECOMMENDATIONS

There has been a downward trend of COVID-19 positivity rate, since early September 2021 (DOH, 2021b). However, the epidemiologic trend should remind us that there have been four COVID-19 surges in the Philippines since the start of the pandemic so far (CDC, 2021d).

In general, majority of the respondents were willing to receive vaccination; however, the root of the problem lies in the lack of vaccine supply. This is evidenced by the high proportion of the unvaccinated respondents waiting for their vaccination schedule. This should be a wake-up call for the Philippines to strengthen its vaccine manufacturing capabilities. Government incentives and subsidies should be provided to local manufacturers who will take up the challenge in preparation for emergence of newer pathogens. Cuba, a country with meager resources and facing long-term US embargo, developed their own COVID-19 vaccine. As of November 2021, 89% of the Cuban population has received at least one dose of their own "Soberana 02" or "Abdala." Initial data showed that three doses of either of these two brands confer at least 92% protection against COVID-19 (Reardon, 2021).

Filipinos have many misconceptions regarding the facts about COVID-19 and its vaccines. Filipinos are also shown to be brand conscious based on their expressed confidence among the different vaccine brands presented. But despite their brand

preference, majority are still willing to accept what is offered by the government. The uncertainty of the vaccine's efficacy and safety is a concern for many of the respondents, but majority of them are convinced that everyone should get vaccination for us to overcome the pandemic.

Among the factors investigated, age grouping and region of residence are significant determinants of a person's risk in falling into the cracks of the government's strategic plan in resolving the current pandemic. In light of the Philippines' lack of vaccine manufacturing capacity, for this pandemic, it is strongly recommended that the government continue to prioritize the purchase of vaccines with a good level of acceptance to the public. Government personnel should have more effective health promotion and education by conducting open forums with the public especially the elderly and those residing in the province to correct their misconceptions and alleviate anxiety regarding COVID-19 and its vaccines.

Even with the increase in proportion of fully vaccinated Filipinos, the government should continue in educating and reminding the public to observe the safety protocols, such as proper wearing of face masks, social distancing, and proper handwashing to protect the sector in the community that is not yet eligible for vaccination against COVID-19.

For future research, it is recommended to further investigate the effect of experiences such as having a family member who got sick or died of a disease and associate it with their decision to accept or delay vaccination.

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